

some of the other motors described herein, a motor disposed in the disposable portion may include one or more shape-memory actuators.

[0512] It should be noted that section headings are included for convenience and are not intended to limit the scope of the invention.

[0513] In various embodiments, the herein disclosed methods including those for controlling and measuring flow of a fluid and for establishing communication amongst linked components may be implemented as a computer program product for use with a suitable controller or other computer system (referred to generally herein as a “computer system”). Such implementations may include a series of computer instructions fixed either on a tangible medium, such as a computer readable medium (e.g., a diskette, CD-ROM, ROM, EPROM, EEPROM, or fixed disk) or transmittable to a computer system, via a modem or other interface device, such as a communications adapter connected to a network over a medium. The medium may be either a tangible medium (e.g., optical or analog communications lines) or a medium implemented with wireless techniques (e.g., microwave, infrared or other transmission techniques). The series of computer instructions may embody desired functionalities previously described herein with respect to the system. Those skilled in the art should appreciate that such computer instructions can be written in a number of programming languages for use with many computer architectures or operating systems.

[0514] Furthermore, such instructions may be stored in any memory device, such as semiconductor, magnetic, optical or other memory devices, and may be transmitted using any communications technology, such as optical, infrared, acoustic, radio, microwave, or other transmission technologies. It is expected that such a computer program product may be distributed as a removable medium with accompanying printed or electronic documentation (e.g., shrink wrapped software), preloaded with a computer system (e.g., on system ROM, EPROM, EEPROM, or fixed disk), or distributed from a server or electronic bulletin board over the network (e.g., the Internet or World Wide Web). Of course, some embodiments of the invention may be implemented as a combination of both software (e.g., a computer program product) and hardware. Still other embodiments of the invention are implemented as entirely hardware, or substantially in software (e.g., a computer program product).

[0515] It should be noted that dimensions, sizes, and quantities listed herein are exemplary, and the present invention is in no way limited thereto. In an exemplary embodiment of the invention, a patch-sized fluid delivery device may be approximately 6.35 cm (~2.5 in) in length, approximately 3.8 cm (~1.5 in) in width, and approximately 1.9 cm (~0.75 in) in height, although, again, these dimensions are merely exemplary, and dimensions can vary widely for different embodiments.

[0516] While the principles of the invention have been described herein, it is to be understood by those skilled in the art that this description is made only by way of example and not as a limitation as to the scope of the invention. Other embodiments are contemplated within the scope of the present invention in addition to the exemplary embodiments shown and described herein. Modifications and substitutions by one of ordinary skill in the art are considered to be within the scope of the present invention.

What is claimed is:

1. Apparatus comprising:
 - a housing comprising a reusable portion and a disposable portion wherein:
 - the disposable portion comprising a substrate having flexible membrane material thereon and incorporating therein a fluid channel, the fluid channel being part of a fluid path in the disposable portion from a reservoir port to a cannula port and comprising a series of regions exposed to the flexible membrane material, at least one of such regions being a valve region; and
 - the reusable portion comprising a control assembly having a mechanical assembly that interacts mechanically with the regions through the membrane material in such a manner as to achieve pumping of fluid along the fluid path, the mechanical assembly including a valve actuator operating on the valve region.
2. Apparatus according to claim 1, wherein the fluid path includes a fluid impedance downstream of the regions so as to prevent pumping of fluid along the path at an unsafe flow rate.
3. Apparatus according to claim 1, wherein the substrate includes a dispensing chamber formed in the fluid channel of the substrate, such chamber bounded by flexible membrane material forming a dispensing chamber membrane.
4. Apparatus according to claim 3, wherein the fluid path includes a fluid impedance downstream of the dispensing chamber, the fluid impedance sufficiently high so as to cause the expansion of the dispensing chamber membrane in response to the pumping of fluid induced by the mechanical assembly.
5. Apparatus according to claim 3, wherein the control assembly includes a fluid sensor in communication with the dispensing chamber for measuring fluid flow through the dispensing chamber.
6. Apparatus according to claim 5, wherein the fluid sensor is an acoustic volume sensor.
7. Apparatus according to claim 6, wherein the acoustic volume sensor includes a loudspeaker, and wherein the loudspeaker is used by the control assembly for both acoustic volume sensing and audible alarm generation.
8. Apparatus according to claim 6, wherein the acoustic volume sensor includes a microphone, and wherein the microphone is used by the control assembly for both acoustic volume sensing and monitoring pump operation.
9. Apparatus according to claim 1, wherein the disposable portion further includes a pump region, and wherein the mechanical assembly further includes a pump actuator operating on the pump region.
10. Apparatus according to claim 9, wherein the mechanical assembly further includes a motor for operation of at least one of the valve actuator and the pump actuator under control of the control assembly.
11. Apparatus according to claim 10, wherein the motor includes a shape-memory actuator.
12. Apparatus according to claim 1, wherein the substrate and the flexible membrane material of the disposable portion constitute a fluidic assembly, and wherein the disposable portion further includes a disposable base into which the fluidic assembly fits.
13. Apparatus according to claim 12, further comprising an adhesive pad coupled to a bottom of the disposable base.